

# UNITED STATES PATENT OFFICE.

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## ELECTRIC SELECTIVE SYSTEM.

1,286,351.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, HOWARD L. KRUM, a citizen of the United States, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Electric Selective Systems, of which the following is a full, clear, and exact description.

The invention relates to selective telegraph systems applicable for the operation of printing telegraphs and the like, and seeks to provide an improved method and system by which the signals or characters of a message can be rapidly transmitted from one station and received or recorded with certainty at a distant station, and which is not liable to be affected by the different conditions and disturbing influences to which the telegraph line may be subjected. A further object of the invention is to provide an improved system which can be duplexed or employed to transmit selective signals in opposite directions over the same line circuit. The invention consists in the features of novelty hereinafter set forth, the preferred arrangement of the circuits of the system being set forth in the accompanying drawings, and the invention being more particularly pointed out in the appended claims.

Figure 1 is a diagram of the circuits in one arrangement of the improved system. Fig. 2 is a diagram of circuits as arranged for the duplex transmission of the signals. Fig. 3 is a diagrammatic representation of the transmitted impulses and of the operation of the selecting devices or relays.

In accordance with the present system, the signals or characters are distinguished by different permutations of a definite number of impulses of opposite polarity. Preferably, there are five impulses in each permutation and the arrangement of circuits shown is designed to employ five impulses in each permutation and, as well known, there are thirty-two permutations of positive and negative impulses when there are five impulses in each permutation, so that thirty-two different signals can be transmitted. By employing an additional sixth impulse in each permutation, the number of signals can be increased to sixty-four. For the ordinary operation of a printing telegraph apparatus, thirty-two permutations are sufficient. How-

ever, for greater certainty of operation and in arranging the present system for duplex work, the line is normally closed and in order to obtain the desired thirty-two different combinations or permutations, it is necessary to transmit a starting impulse which is not varied but is always of the same polarity. For example, if the line circuit is normally connected to the negative side of the battery, the starting impulse for each combination or signal will be positive. If the line is normally connected to the positive side of the battery, the starting impulse of each combination will be negative. The remaining five impulses of each signal will form the thirty-two permutations to effect the desired selective operation of the receiving circuits.

The present system has been applied to an improved transmitting and receiving apparatus devised by Charles L. Krum and myself and set forth in a U. S. Letters Patent No. 1,232,045, dated July 3, 1917. One arrangement of the present improved selective system was set forth in the application referred to in order that the invention therein set forth could be clearly understood. The present improvement is, however, applicable to other forms of transmitting and receiving apparatus.

In some respects the present improved arrangement of transmitting and receiving or selecting circuits and relays may be considered an improvement upon an electric telegraph or selective system devised jointly by Charles L. Krum and myself and set forth in U. S. Letters Patent No. 1,199,011, dated September 19, 1916. In certain other respects the present improved system is essentially different, as hereinafter pointed out.

Fig. 1 is a diagram of the circuits and selecting relays and magnets at one station. A set of signal selecting or pole changing switches A are connected to a set of five line branch conductors 1, 2, 3, 4 and 5. These branch conductors are connected respectively to the normally disengaged or front contacts of a set of five transmitting switches  $b^1$ ,  $b^2$ ,  $b^3$ ,  $b^4$  and  $b^5$ , arranged to be operated by a set of transmitting relays  $B^1$ ,  $B^2$ ,  $B^3$ ,  $B^4$ , and  $B^5$ . In the arrangement shown, the normally engaged or back contacts of the selecting switches or pole changers A